

## Listing of Claims:

1. (Currently Amended) A method of an opto-chemical multiband sensing comprising steps of: providing a composition capable of to be excited by a surface plasmon resonance source, the composition comprising a fluorophore and a nanoparticle, wherein the fluorophore there is within 40 micrometers from the nanoparticle and the fluorophore has a multiband spectral property when the nanoparticle is excited by the source; placing the composition to a sample containing an analyte to allow for a chemical interaction of the fluorophore with the analyte; irradiating the sample by the source; and analyzing the multiband spectral property of the fluorophore for each chemical interaction of the fluorophore with the analyte.

~~A method of plasmon-induced multiband optical sensing or molecular identification comprising steps of: providing a composition capable of characteristic multiband spectral absorption or multiband spectral emission, the composition comprising a molecule and a plasmon-excited nanoparticle, wherein the molecule is located within plasmon fields of the nanoparticle and the molecule has a plasmon-induced multiband spectral property; allowing a sample containing an analyte to interact with the compositions; and monitoring the multiband spectral absorption or multiband spectral emission of the molecule for each interaction between the composition and the analyte of the sample.~~

2. (Currently Amended) The method of claim 1, wherein the ~~molecule~~ fluorophore is an organic molecule, an inorganic molecule, a biomolecule or a microbe.

3. (Currently Amended) The method of claim 2, wherein the ~~molecule~~ is fluorophore [[and]] is selected from the group consisting of: a protein, amino acid, oligonucleotide, lipid, sugar moiety, purine or pyrimidine, nucleoside or nucleotide, genetically engineered biomolecule, fluorescence dye, fluorescence biomarker, metal ligand charge transfer complex, up-converted fluorophore, fluorescence dendrimer, pair of fluorescent donor and fluorescent acceptor, pair of fluorescent donor and quencher, or fluorescent metal nanoparticle.
4. (Original) The method of claim 1, wherein the analyte is selected from the group consisting of glucose, inorganic molecule, organic molecule, protein, amino acid, oligonucleotide, lipid, sugar moiety, purine or pyrimidine, nucleoside or nucleotide.
5. (Currently Amended) The method of claim 1, wherein the composition further comprising a spacer placed between the ~~molecule~~ fluorophore and the nanoparticle and the spacer is selected from the group consisting of: a biorecognitive spacer, a dielectric spacer, a chemical link spacer, an analyte sensitive spacer or a polymer spacer.
6. (Currently Amended) The method of claim 1, wherein the nanoparticle is ~~made of a~~ metal or is a material with an electric property selected from the group of: conductor, super-conductor, semiconductor or dielectric.
7. (Original) The method of claim 6, wherein the metal is selected from the group consisting of silver, ruthenium, platinum, rhenium, rhodium, osmium, iridium, copper, palladium and gold.
8. (Currently Amended) The method of claim 1, wherein the ~~metal~~ nanoparticle is ~~sub-~~ wavelength less than 200 microns in size.

9. (Currently Amended) The method of claim ~~[[1]]~~ 5, wherein the spacer separates the ~~molecule~~ fluorophore from the ~~metal~~ nanoparticle by a distance longer than ~~10 nm~~ 0.1 nm and less than 40 microns.
10. (Currently Amended) ~~The method of claims 1, wherein the~~ A sensor for opto-chemical sensing comprises of: ~~the single metal~~ a nanoparticle capable of to be excited by a surface plasmon resonance source; a fluorophore having a multiband spectral property, when the fluorophore there is within 40 nm from the plasmon excited nanoparticle; a spacer separating the nanoparticle from the fluorophore by a distance less than 40 microns; electromagnetic radiation interacting with molecules at the specific location the source; and a spectral monitoring device.
11. (Currently Amended) The ~~method~~ sensor of claim ~~[[1]]~~ 10, wherein the sensor comprises at least one thin film of the nanoparticles coated on ~~an optical material of refractive index values from 1 to 3.5 and electromagnetic radiation interacting with the molecules and metal nanoparticles the spacer.~~
12. (Currently Amended) A method of claims 1, wherein the opto-chemical multiband sensing is further used for a molecular identification of the fluorophore.

~~A method of claims 1, for optochemical sensing of the multiband absorption and multiband fluorescence of the molecule, said method comprising the steps of: (a) positioning the nanoparticle and the molecule at a distance apart sufficient to manipulate the multiband fluorescence from the molecule; (b) exposing the molecule to exciting radiation in the single-photon and multi-photons modes of excitation; and (c) analyzing the multiband absorption and multiband fluorescence from the molecule.~~

13. (Currently Amended) The ~~method~~ sensor of claim [[1]] 10, wherein the ~~composition~~ sensor is ~~placed in~~ a microarray, a bio-chip, a flow cell, an endoscope, a microscopic slide, a total internal reflection cell, a catheter, an optical fiber, or a waveguide, ~~a body, food, soil, water or air.~~

14. (Currently Amended) The method of claim 1, wherein the ~~electromagnetic radiation~~ source is selected from the group consisting of: a laser with single wavelength, laser with plurality wavelengths, laser diode, light emitted diode, lamp, bioluminescence, chemiluminescence, or electroluminescence.

15. (Currently Amended) The method of claim 1, wherein the method ~~further~~ comprises analyses of a low excited state or higher excited states of absorption bands or fluorescence bands of the ~~molecule~~ fluorophore.

16. (Currently Amended) The method of claim ~~1, and~~ 12, wherein the ~~method of~~ molecular identification comprises analyses an analysis of the ~~low excited state and higher excited states absorption and fluorescence bands of the molecule~~ multiband spectral property of the fluorophore.

17. (Currently Amended) The method of claim [[1]] 16, wherein the ~~monitoring analysis~~ of the multiband spectral property of fluorophore ~~absorption and/or the multiband emission of the molecule~~ is performed by at least one of the selected techniques: absorption, fluorescence, time-resolved, polarization, energy transfer, hyperspectral imaging, Raman scattering, microscopy or microscopy imaging.

18.–19. Cancelled

20. The method of claim 5, wherein the spacer further modifies the ~~plasmon-induced~~ multiband spectral property of the ~~molecule~~ fluorophore.

## Listing of Claims:

1. A method of an opto-chemical multiband sensing comprising steps of: providing a composition capable of to be excited by a surface plasmon resonance source, the composition comprising a fluorophore and a nanoparticle, wherein the fluorophore there is within 40 micrometers from the nanoparticle and the fluorophore has a multiband spectral property when the nanoparticle is excited by the source; placing the composition to a sample containing an analyte to allow for a chemical interaction of the fluorophore with the analyte; irradiating the sample by the source; and analyzing the multiband spectral property of the fluorophore for each chemical interaction of the fluorophore with the analyte.
2. The method of claim 1, wherein the fluorophore is an organic molecule, an inorganic molecule, a biomolecule or a microbe.
3. The method of claim 2, wherein the fluorophore is selected from the group consisting of: a protein, amino acid, oligonucleotide, lipid, sugar moiety, purine or pyrimidine, nucleoside or nucleotide, genetically engineered biomolecule, fluorescence dye, fluorescence biomarker, metal ligand charge transfer complex, up-converted fluorophore, fluorescence dendrimer, pair of fluorescent donor and fluorescent acceptor, pair of fluorescent donor and quencher, or fluorescent metal nanoparticle.
4. The method of claim 1, wherein the analyte is selected from the group consisting of glucose, inorganic molecule, organic molecule, protein, amino acid, oligonucleotide, lipid, sugar moiety, purine or pyrimidine, nucleoside or nucleotide.
5. The method of claim 1, wherein the composition further comprising a spacer placed between the fluorophore and the nanoparticle and the spacer is selected from the

- group consisting of: a biorecognitive spacer, a dielectric spacer, a chemical link spacer, an analyte sensitive spacer or a polymer spacer.
6. The method of claim 1, wherein the nanoparticle is a metal or is a material with an electric property selected from the group of: conductor, super-conductor, semiconductor or dielectric.
  7. The method of claim 6, wherein the metal is selected from the group consisting of silver, ruthenium, platinum, rhenium, rhodium, osmium, iridium, copper, palladium and gold.
  8. The method of claim 1, wherein the nanoparticle is less than 200 microns in size.
  9. The method of claim 5, wherein the spacer separates the fluorophore from the nanoparticle by a distance longer than 0.1 nm and less than 40 microns.
  10. A sensor for opto-chemical sensing comprises of: a nanoparticle capable of to be excited by a surface plasmon resonance source; a fluorophore having a multiband spectral property, when the fluorophore there is within 40 nm from the plasmon excited nanoparticle; a spacer separating the nanoparticle from the fluorophore by a distance less than 40 microns, the source; and a spectral analyzer.
  11. The sensor of claim 10, wherein the sensor comprises at least one thin film of the nanoparticles coated on the spacer.
  12. A method of claims 1, wherein the opto-chemical multiband sensing is further used to a molecular identification of the fluorophore.
  13. The sensor of claim 10, wherein the sensor is a microarray, a bio-chip, a flow cell, an endoscope, a microscopic slide, a total internal reflection cell, a catheter, an optical fiber, or a waveguide.

14. The method of claim 1, wherein the source is selected from the group consisting of: a laser with single wavelength, laser with plurality wavelengths, laser diode, light emitted diode, lamp, bioluminescence, chemiluminescence, or electroluminescence.

15. The method of claim 1, wherein the method comprises analyses of a low excited state or higher excited states of absorption bands or fluorescence bands of the fluorophore.

16. The method of claim 12, wherein the molecular identification comprises an analysis of the multiband spectral property of the fluorophore.

17. The method of claim 16, wherein the analysis of the multiband spectral property of fluorophore is performed by at least one of the selected techniques: absorption, fluorescence, time-resolved, polarization, energy transfer, hyperspectral imaging, Raman scattering, microscopy or microscopy imaging.

18.–19. Cancelled

20. The method of claim 5, wherein the spacer further modifies the multiband spectral property of the fluorophore.